

REMARKS

The Pending Claims

Claims 1 and 17-24 are currently pending. Claims 1 and 17-24 are directed to a method of polishing a tungsten-containing substrate comprising the use of a composition comprising a silica abrasive and a liquid carrier, wherein the composition has a pH of 4-6 and the silica abrasive has a total surface hydroxyl group density no greater than about 3 hydroxyl groups per nm². Reconsideration of the pending claims is respectfully requested.

Amendments to the Claims

Claim 1 has been amended to incorporate the features of claims 4 and 11, and to recite a pH of 4-6. Support for the pH range can be found in the instant specification at page 5, lines 6-7. Claims 2-16 have been canceled. Claims 5-9 and 12-14 have been rewritten as claims 17-24. No new matter has been added by way of any of these amendments.

Summary of the Office Action

Claims 1-16 stand rejected under 35 U.S.C. § 103(a) as obvious over Cadien et al. (i.e., U.S. Patent 5,340,370) or Feeney et al. (U.S. Patent 6,294,105) in view of Ohmi et al. (i.e., U.S. Patent 5,895,509) or, alternatively, in view of Kohyama et al. (i.e., U.S. Patent 4,664,679).

Discussion of the Obviousness Rejections

The obviousness rejections are moot in view of the amendments to the claims.

Cadien et al. fails to disclose a method of polishing a substrate comprising tungsten by abrading at least a portion of the surface of the substrate with a composition comprising a silica abrasive and a liquid carrier, wherein the composition has a pH of 4-6 and the silica abrasive has a total surface hydroxyl group density no greater than about 3 hydroxyl groups per nm². Cadien et al. discloses a CMP slurry for polishing tungsten comprising silica abrasive and a liquid carrier, and having a pH less than 4 and greater than 2 (see, e.g., col. 2, lines 55-57). Nothing in Cadien et al. teaches or suggests a pH of 4-6.

Feeney et al. fails to disclose a method of polishing a substrate comprising tungsten by abrading at least a portion of the surface of the substrate with a composition comprising a silica abrasive and a liquid carrier, wherein the composition has a pH of 4-6 and the silica abrasive has a total surface hydroxyl group density no greater than about 3 hydroxyl groups per nm². Feeney et al. discloses a CMP slurry for polishing tungsten comprising silica abrasive and a liquid carrier, and having a pH of about 1.2 to 1.4. Nothing in Feeney et al. teaches or suggests a pH of 4-6.

Ohmi et al. fails to satisfy the deficiencies of either Cadien et al. or Feeney et al. Ohmi et al. discloses an abrasive composition comprising abrasive grains, isopropyl alcohol, and water. There is nothing in Ohmi et al. that suggests that abrasive grains in the presence of isopropyl alcohol will have a total surface hydroxyl group density no greater than about 3 hydroxyl groups per nm². As discussed in the instant specification at page 4, lines 18-19, esterification of surface hydroxyl groups with an alcohol preferably is conducted in a gas phase at a temperature between the boiling point of alcohol and 350 °C. The mere presence of isopropyl alcohol in a solution with a metal oxide abrasive is insufficient to reduce the surface silanol groups such that the abrasive has a total surface hydroxyl group density no greater than about 3 hydroxyl groups per nm². Moreover, Ohmi et al. is silent as to pH.

Similarly, Kohyama et al. fails to satisfy the deficiencies of either Cadien et al. or Feeney et al. Kohyama et al. discloses a silica abrasive with a silanol group density of from 0.3 to 3 per nm²; however, Kohyama et al. is silent as to pH.

Since the cited references, either alone or in combination, fail to disclose all of the elements of the invention as recited pending claims, the obviousness rejections should be withdrawn.

Conclusion

The application is considered in good and proper form for allowance, and the Examiner is respectfully requested to pass this application to issue. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned agent.

Respectfully submitted,



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